

FORM PTO-1380

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE
TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER:
52297-64180-KLN/KCL

U.S. PCT IN. NO. (if known, see 37 CFR 1.5)

09/856300

INTERNATIONAL APPLICATION NO.:
PCT/SE99/02130

INTERNATIONAL FILING DATE:
November 19, 1999

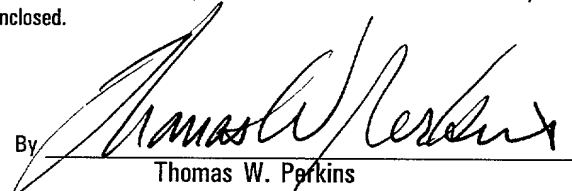
PRIORITY DATE CLAIMED:
November 19, 1998

TITLE OF INVENTION: FASTENER MEANS

APPLICANT(S) FOR DO/EO/US: Ingbritt MAGNUSSON

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
 2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
 3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
 4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
 5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ has been transmitted by the International Bureau. (see attached copy of PCT/IB/308)
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
 - ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
 - ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
 - ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
 9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
 10. ☐ A translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).
- Item 11. to 16. below concern document(s) or information included:
11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
 12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
 13. ☒ A **FIRST** preliminary amendment.
 - ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
 14. ☐ A substitute specification.
 15. ☐ A change of power of attorney and/or address letter.
 16. ☒ Other items or information:
 - International Preliminary Examination Report (PCT/IPEA/409)
 - International Search Report (PCT/ISA/210)
 - Application Data Sheet
 - Abstract on a separate sheet

| | | | | | |
|---|-------------------------------------|--|---|--|---------|
| U.S. APPLICATION NO. 09/856300 | | INTERNATIONAL APPLICATION NO. PCT/SE99/02130 | | ATTORNEY'S DOCKET NO. 52297-64180-KLN/KCL | |
| 17. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$ 1,000.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$ 860.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$ 710.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$ 690.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$ 100.00 <div style="text-align: right;">ENTER APPROPRIATE BASIC FEE AMOUNT =</div> | | | | CALCULATIONS PTO USE ONLY | |
| | | | | | |
| Surcharge of \$130.00 for furnishing the oath or declaration later than months from the earliest claimed priority date (37 CFR 1.492(e)). | | | | \$ | |
| <input type="checkbox"/> CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE | \$ | |
| Total claims | 21 - 20 = | 1 | X \$18.00 | \$ | 18.00 |
| Independent claims | 1 - 3 = | 0 | X \$80.00 | \$ | 0 |
| MULTIPLE DEPENDENT CLAIMS(S) (if applicable) | | | + \$270.00 | \$ | |
| TOTAL OF ABOVE CALCULATIONS = | | | | \$ | 1018.00 |
| Reduction of 1/2 for filing by small entity, if applicable. Applicant claims Small Entity Status under 37 CFR 1.27. | | | | \$ | |
| SUBTOTAL = | | | | \$ | 1018.00 |
| Processing fee of \$130 for furnishing the English translation later than months from the earliest claimed priority date (37 CFR 1.49(f)). | | | | \$ | |
| TOTAL NATIONAL FEE = | | | | \$ | 1018.00 |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property | | | | \$ | 40.00 |
| TOTAL FEES ENCLOSED = | | | | \$ | 1058.00 |
| | | | | Amount to be refunded: | |
| | | | | charged: | |
| a. | <input checked="" type="checkbox"/> | A check in the amount of \$ 1058.00 to cover the above fees is enclosed. | | | |
| b. | <input type="checkbox"/> | Please charge my Deposit Account No. 25-0120 in the amount of \$ to cover the above fees. A duplicate copy of this sheet is enclosed. | | | |
| c. | <input checked="" type="checkbox"/> | The Commissioner is hereby authorized to charge any additional fees which may be required by 37 CFR 1.16 and 1.17, or credit any overpayment to Deposit Account No. 25-0120 . A duplicate copy of this sheet is enclosed. | | | |
| SEND ALL CORRESPONDENCE TO: Customer No. 000466 YOUNG & THOMPSON 745 South 23rd Street 2nd Floor Arlington, VA 22202 (703) 521-2297 facsimile (703) 685-0573 | | | | | |
| | | | By  | Thomas W. Perkins Attorney for Applicant Registration No. 33,027 | |

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APPLICATION INFORMATION

Title Line One:: FASTENER MEANS
Total Drawing Sheets:: 4
Formal Drawings?:: YES
Application Type:: UTILITY
Docket Number:: 52297-64180-KLN/KCL

REPRESENTATIVE INFORMATION

Representative Customer Number:: 000466

CONTINUITY INFORMATION

This application is a:: 371 OF
>Application One:: PCT/SE99/02130
Filing Date:: 19 NOVEMBER 1999

PRIOR FOREIGN APPLICATION

Foreign Application One:: 9803970-4
Filing Date:: 19 NOVEMBER 1998
Country:: SWEDEN
Priority Claimed:: YES

PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Ingbritt MAGNUSSON

Serial No. (Unknown)

Filed herewith

FASTENER MEANS

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents

Washington, D.C. 20231

Sir:

Prior to calculation of the filing fee, please amend the above-identified application as follows:

IN THE CLAIMS:

Cancel claims 1-21.

Add the following new claims:

--22. (New) Nonwoven fabric that includes a surface for fastening the male component of a hook and loop fastener system which comprises a loop-free, carded and needled fabric of functional fibres and binding fibres, wherein the functional fibres are comprised of thermoplastic polymer fibres, and where the nonwoven fabric is bonded by partially melting the binding fibres.

23. (New) A nonwoven fabric according to Claim 22, wherein the functional fibres are comprised of one or more types of polyester fibres and/or polypropylene fibres.

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24. (New) A nonwoven fabric according to Claim 23, wherein the fabric includes two types of functional polyester fibres of mutually different thickness.

25. (New) A nonwoven fabric according to Claim 22, wherein the functional fibres include spiralled bi-component fibres or multi-component fibres of the side-by-side type.

26. (New) A nonwoven fabric according to Claim 25, wherein the functional fibres include both crimped polyester fibres and spiralled fibres.

27. (New) A nonwoven fabric according to Claim 22, wherein the fabric contains 10-25% by weight binding fibres and 75-90% by weight functional fibres.

28. (New) A nonwoven fabric according to Claim 22, wherein 40-60% by weight of the functional fibres are spiralled fibres.

29. (New) A nonwoven fabric according to Claim 22, wherein the binding fibres comprise bi-component fibres that include a core and an outer casing, where the outer casing component has a lower melting point than the inner core component.

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30. (New) A method of producing a nonwoven fabric that has a fastener surface according to Claim 22, comprising carding a mixture of binding fibres and functional fibres comprised of thermoplastic polymer fibres to form a fibrous web; needling said fibrous web to obtain a dense material that has a loop-free, open structure suitable for the male component of a hook and loop fastener to fasten thereto; and heating said needled fibrous web so as to partially melt said binding fibres.

31. (New) A method according to Claim 30, comprising smooth calendaring said needled and heated fibrous web so that one surface thereof will be smooth.

32. (New) A method according to Claim 30, wherein said binding fibres are comprised of bi-component fibres that include a core and a casing, where said casing has a lower melting point than the core; and wherein said needled fibrous web is heated so that the casings of respective binding fibres will melt while said core remain solid.

33. (New) An absorbent article, such as a diaper or incontinence guard, which includes a substantially liquid-impermeable backing sheet and a hook and loop fastener system that includes a female component and a male component attached to said backing sheet for mutual coaction such as to secure

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the article in position on a wearer, wherein said female component of said system is comprised of a nonwoven fabric according to Claim 22.

34. (New) An article according to Claim 33, wherein said article includes an absorbent body enclosed between a liquid-permeable inner sheet that lies proximal to the wearer in use and said substantially liquid-impermeable backing sheet that lies distal from the wearer in use, said backing sheet being delimited by two short sides and two long sides, two male-component tabs belonging to said fastener system being fastened to said backing sheet on each of said long sides close to one short side, so as to form an extension of said short side with said male component facing in the same direction as the inner sheet; and wherein said female component is provided on said backing sheet at the outer short side.

35. (New) An article according to Claim 34, wherein one female component piece is provided in each corner of said second short side.

36. (New) An article according to Claim 34, wherein said female component is comprised of a strip that extends essentially along the full length of said second short side.

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37. (New) An article according to claim 33, wherein said article includes two parts, a belt which is intended to be fastened around the waist of a wearer, and an absorbent part which, in use, is fastened to the belt by means of mutually coacting male and female components of the hook and loop fastener system and which includes an absorbent body enclosed between a liquid-permeable inner sheet intended to lie proximal to the wearer in use and in said substantially liquid-impermeable backing sheet intended to lie distal from the wearer in use and delimited by two short sides and two long sides, the mutually coacting components being disposed along said short sides of said absorbent body and on said belt respectively.

38. (New) An article according to Claim 37, wherein said female component is disposed on an inner surface of said belt and said male component is disposed on an outer surface of said absorbent body.

39. (New) An article according to Claim 37, wherein said male component is disposed on an inner surface of said belt and said female component is disposed on an outer surface of said absorbent body.

40. (New) An article according to Claim 37, wherein said male component is disposed on an outer surface of said belt

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and said female component is disposed on an inner surface of said absorbent body.

41. (New) An article according to Claim 37, wherein said female component is disposed on an outer surface of said belt and said male component is disposed on an inner surface of said absorbent body.

42. (New) The use of a nonwoven fabric that includes a fastener surface according to Claim 22, which comprises a carded and needled fibrous web of functional fibres and binding fibres, where the functional fibres are comprised of thermoplastic polymer fibres, and where the nonwoven fabric is bonded by partially melting the binding fibres, as the female component in a hook and loop fastener system in an absorbent article, such as a diaper or incontinence guard, which includes a substantially liquid-impermeable backing sheet and a hook and loop fastener system that includes a female component and a male component attached to said backing sheet for mutual coaction such as to secure the article in position on a wearer.--

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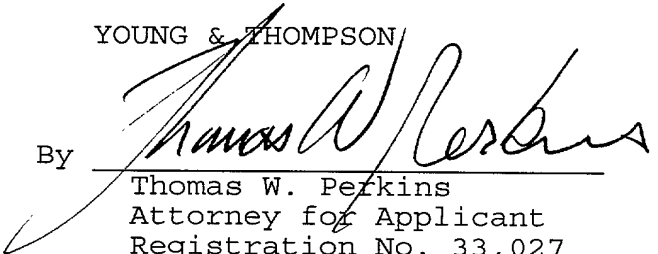
R E M A R K S

The above changes in the claims merely place this national phase application in the same condition as it was during Chapter II of the international phase, with the multiple dependencies being removed.

Respectfully submitted,

YOUNG & THOMPSON

By


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May 21, 2001

A nonwoven fabric (1) that includes a fastener surface for the male component (2) of a hook and loop fastener system, comprising a carded and needled fibrous web of functional fibres and binding fibres, where the functional fibres are comprised of thermoplastic polymer fibres and the nonwoven fabric is bonded by partially melting the binding fibres. A method of producing such nonwoven fabric (1) by carding a mixture of binding fibres and functional fibres to form a fibrous web, needling the fibres web to obtain a dense material that has a structure on which the male component of a hook and loop fastener system is able to fasten, and heating the needled fibrous web to partially melt the binding fibres. A absorbent article, such as a diaper, having an absorbent body enclosed between an outer and an inner sheet and including a hook and loop fastener system with which the article can be secured to a wearer, wherein the female component (1) of the system is comprised of nonwoven fabric.

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FASTENER MEANS

The present invention relates to a material that can function as a fastener surface for
5 the male component of a hook and loop fastener system, to a method of producing said material, and to an absorbent article, such as a diaper, in which the material is used as fastener means, and to a use of said material as female component in a hook and loop fastener system in an absorbent article.

10 In absorbent articles, such as diapers and incontinence guards for instance, the article is often secured to the wearer with the aid of a hook and loop fastener system. Such fastener means comprise a male and a female component, where the former is comprised of hooks and the latter is comprised of loops. These two fastener components can be fastened together and thereafter separated from one another.

15 The fastener devices comprise loops and hooks formed on one side of a fibre tape which is bonded to a carrier tape. The opposite surface of the carrier tape is suitably adhesive, so as to enable the tape to be fastened easily to an article.

20 The described two-layer construction that includes a carrier is necessary in order to ensure that the fastener device will be sufficiently strong and can be fastened to an absorbent body, e.g. glued thereto.

25 Known loop-carrying tape material is formed, e.g., by gluing a loop-carrying fibrous web to a carrier web, by needling loops from a fibrous web through a carrier web, or by melting one surface of a loop-carrying fibrous web that includes hot hotmelt fibres, so as to obtain a coherent carrier surface. Such materials are described in, for instance, EP-A2-0780505, WO96/04812, WO95/33390, WO92/20251, US-A-3,694,867, EP-A2-0258015, WO95/17111 and
30 EP-A1-0765616.

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One drawback with such fastener devices is that the laminate construction is not cost-effective, due to material consumption on the one hand and to the fact that several process steps are required on the other hand. Furthermore, the fastener device can be unnecessarily rigid and therefore uncomfortable, and may even chafe the wearer's skin. However, fastener devices of this type known hitherto have always required a carrier in order to be used and applied to an absorbent article, such as a diaper or an incontinence guard, and to bind together sufficiently strongly to ensure that the loops will not separate from the material as a hook and loop fastener is fastened to the material and then released and refastened at one and the same place or at some other place.

The object of the present invention is to provide a fastener device which is less expensive and more pliable than earlier known devices and the material of which is sufficiently stable for use as a female component to the male component of a hook and loop system.

This object is achieved in accordance with the invention with a fastener device that consists of a nonwoven fabric comprised of a carded fibrous web of functional polymer fibres and binding fibres that are bound together mechanically by needling. Additional binding is effected by partially melting the binder fibres. This results in a relatively dense material that has a sufficiently open structure to enable the male component of a hook and loop system to fasten therein. The fastener device is also sufficiently stable to prevent the fibres from being torn away from the surface as the hook component of the fastener is released. It is also sufficiently stable for the hook component of the fastener to be fastened, released from the fastener device and moved to a new position thereon.

The nonwoven fabric can thus be used instead of the conventional looped female component of a hook and loop fastener system. The nonwoven fabric, however, has no loops. On the other hand, the fastener surface is slightly rugged.

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The carded fibre mixture will conveniently comprise 10-25% binding fibres and 75-90% functional fibres. The functional fibres will preferably consist of a mixture of two or more types of fibre, suitably 40-60% of one type and 60-40% of another type. The functional fibres are either crimped single-component fibres or spiralled bi-

5 component fibres or multi-component fibres of the side-by-side type. There may be used a mixture of several types of crimped fibres, crimped and spiralled fibres, or several types of spiralled fibres. The spiralled fibres may have already be spiralled when preparing the fibre mixture to be carded and needled. It is also possible to use multi-component fibres of the side-by-side type that are spiralled during manufacture

10 of the fastener device, conveniently when applying heat so as to partially melt the binding fibres.

It is also possible to use different polymer materials in the fibres of the inventive fastener device. Polyester fibres and polypropylene fibres are preferred. In bi-

15 component fibres or multi-component fibres there can be used two types of polyester that have mutually different melting and expansion coefficients, or, e.g., polyester as one component and another polymer material, e.g. polypropylene, as other components. The binding fibres may comprise bi-component fibres of polypropylene and polyethylene.

20 Different types of functional polyester fibres having varying lengths, thicknesses, etc., may be used in the manufacture of the inventive fastener device. A suitable thickness of the functional fibres is 1-6 dn, particularly 1.5-6 dn. When using only one type of fibre, such as polyester type fibres, fibres of two different thicknesses may be mixed

25 together. A suitable length of both binding fibres and functional fibres is 30-80 mm, preferably 40-70 mm and then particularly about 60 mm.

Spiralled fibres may also be included in the mixture, to create a surface structure.

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The polyester fibre fabric according to the invention can be used directly as fastener means and glued directly to a diaper for instance, in the absence of an intermediate carrier.

- 5 According to one preferred embodiment of the invention, the polyester nonwoven material includes spiralled fibres. The spiralled fibres that can be used in the inventive fastener device are suitably of the same type as those described in SE 9604833-5. These fibres are comprised of heat-crimped, spiralled, elastic thermoplastic multi-component fibres, preferably bi-component fibres. The components in the fibres are
- 10 suitably disposed side-by-side. As the fibres are heat-treated the various components shrink to mutually different extents and thereby form the spiralled fibre.

- In accordance with the invention, binding of the material can be further improved by calendering the material, i.e. with the aid of pressure and heat. Smooth-calendering is
- 15 used in particular on one side of the material.

- The inventive nonwoven fabric will now be described with reference to particular embodiments thereof and also with reference to the accompanying drawings, in which Figs. 1-7 are schematic illustrations of the various steps that are carried out when
- 20 testing the adhesiveness or holding strength of a hook and loop system; Fig. 8 is a schematic view from above of a diaper in which the inventive nonwoven fabric is used as a tape landing zone system; and Figs. 9 and 10 show parts of a diaper or incontinence guard that include a replaceable absorbent part.

- 25 Manufacture of the inventive fastener device is commenced by forming a nonwoven fabric from binding fibres and functional fibres. These fibres are then bound mechanically, suitably by needling, until there is obtained a relatively dense material that has a structure which is sufficiently open for the male component of a hook and
- 30 loop fastener system to fasten therein and which is sufficiently stable to prevent an excessive number of fibres being loosened from the fastener device as the male

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component of said device is pulled away. Needling imparts to the material a slightly rugged surface that functions as a fastening surface. The material is then generally equilateral. The material is then heated so as to partially melt the binding fibres and to hold the fastener device together. Any multi-component fibres of the side-by-side type present will be spiralled in this heating process. As the fibres spiral, the needed nonwoven fabric will shrink to some extent and the ruggedness of the surface increase. One side of the material is then suitably smooth calendered. The smooth surface of the material thus obtained facilitates gluing of said surface to an article. This smooth calendering of said surface shall not be confused with the heat smelting process described in, e.g., EP-A1-0 780 505 for forming a carrier surface.

It is necessary to establish the extent to which needling shall be carried out, by experimenting with the material produced. In addition to a subjective assessment of the density of the material, its adhesiveness, and integrity, the shear force and peeling force required to release the fastener device from a hook-carrying part of the device can be measured in accordance with the following.

In the following description of the tests carried out, the female and male components of the hook and loop fastener systems are referred to as loop components and hook components respectively, regardless of whether these fastener parts present respectively loops and hooks as in a typical loop and hook fastener system or whether they lack the presence of loops, for instance, such as in the case of the inventive nonwoven fabric that includes a fastener surface.

DESCRIPTION OF EMBODIMENTS

Tests were carried out with the following mixtures.

5

| PARAMETERS | Test 1, 08-370 | Test 2, 08-378 | Test 3, 08-379 |
|-------------------|----------------|------------------|----------------------|
| Binding fibers % | 15 % 4 dn bico | 20 % 2 dn bico | 20 % 2 dn bico |
| Supplier | UNITIKA | HOECHST | HOECHST |
| Type | Melty 4080 | Trevira T 254 | Trevira T 254 |
| Functional fibres | 50 % 3 dn | 40 % 3 dn | 40 % 6dn conj.hollow |
| Supplier | HOECHST | HOECHST | NAN YA |
| Type | Trevira T 290 | Trevira T 290 | |
| Functional fibres | 35 % 1,5 dn | 40 % 3 dn spiral | 40 % 3 dn spiral |
| Supplier | HOECHST | RHONE-POULENC | RHONE-POULENC |
| Type | Trevira T 290 | Tergal X443 | Tergal X403 |

Tergal X443 and Tergal 403 are bi-component fibres of the side-by-side type that spiral when heated. The two components are comprised of two types of polyester that have mutually different melting points. NAN YA is a fibre that has already been spiralled and which also comprises bi-component polyester of the side-by-side type. All of the binding fibres are of the kind that includes a polyester core and a co-polyester casing.

As will be seen, two crimped polyester fibres of mutually different thickness were used in Test 1. In Test 2, there was used a crimped polyester fibre in mixture with a bi-component fibre that spiralled when heated. In Test 3, there was used a polyester fibre that had already spiralled in mixture with a bi-component fibre that spiralled when heated. A bi-component fibre of the type that includes a core which melts at high temperature and a casing which melts at low temperature were used as binding fibre in

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all tests. The material was heated until the binding fibre casing melted, but was stopped before the core melted.

Samples**Description**

| | | |
|----|----------------------|--|
| 5 | EKL, loop material | Standard knitted polyester fabric coated with polypropylene, weight per unit area 90g/m ² (PET 47.5, PP 42.5 g/m ²) |
| | 08-370 K | Smooth calendered, long hotmelt fibres |
| 10 | 08-378, thick fibres | Side-by-side fibres that shrink and spiral in-line |
| | 08-379, fine fibres | Side-by-side fibres that shrink and spiral in-line |

15 DETERMINING THE SHEAR FORCE OF A HOOK AND LOOP FASTENER SYSTEM

Principle

20 The hook material and the loop material are joined together in a controlled fashion. The shear force is then measured with a tensile testing device.

Sample preparation

- 25 Choose sample combination according to Fig. 1. MD denotes machine direction and CD denotes cross direction.
- Punch out the loop samples, 50 x 60 mm and mark with a pen according to Figs. 2A, B. Fig. 2A shows a roll of loop material 1 and Fig. 2B shows a roll of hook material 2.
- 30 Cut out the hook samples, 25 x 80 mm, and mark with an asterisk and arrow respectively, to show respective directions on the sample.

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- Make a mark 30 mm in from the edge of the hook sample in accordance with Fig. 3A. The CD-directions shall be tested primarily.

Procedure

- 5
- Place the hook sample 2 carefully over the loop sample 1. The contact surface shall measure 30 x 25 mm. See Fig. 3A.

Place the hook and loop sample 2 and 1 respectively in the roll apparatus and allow the pressure roll 3 to roll forwards and backwards one time (one cycle); see Fig. 4.

- 10
- Place the whole of the sample in the tensile testing device 4 with the hook material 2 in the upper clamp 5 and the loop material 1 in the lower clamp 6, as shown in Fig. 5. The materials are pulled in the direction of the arrow F.
 - Continue with the test until the materials are fully "delaminated".

Calculations and results

- 15
- 20
- | | | |
|-----------|---|---|
| T_{max} | = | Shear force, N/cm ² |
| F_{max} | = | The highest force detected during "delamination", N |
| l | = | The length of the contact surface, mm |
| b | = | The width of the contact surface, mm |
| T_{max} | = | $\frac{F_{max} \times 100}{l \times b}$ |

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DETERMINING THE DELAMINATING FORCE OF A HOOK AND LOOP FASTENER SYSTEM

Principle

5

The hook material and the loop material are joined together in a controlled fashion. The delaminating force is then determined with the aid of a tensile testing device with the material at 90°.

10 Sample preparation

- Select a sample combination according to Fig. 1.
- Punch out the loop samples 1, 50 x 60 mm, and mark with a pen according to Fig. 2A.
- Clip/cut out the hook samples 2, 25 x 80 mm, and mark with a star and an arrow respectively, so as to show respective directions on the sample according to Fig. 2B.
- Make a mark 30 mm from one edge of the hook sample 2 - see Fig. 3B.
The CD directions shall be tested primarily.

20 Procedure

- Place over the hook sample 2 a piece of tape 7 which is sufficiently large to leave free a surface measuring 25 x 30 mm.
- Place the hook sample 2 over the loop sample 1. Leave 10 mm of the loop strip 3 for fastening the strip in the clamp; see Fig. 3B.
- 25 ▪ Place the hook sample 2 + the loop sample 1 in the roll apparatus and allow the pressure roll 3 to roll forwards and backwards one time (one cycle) - see Fig. 4. Begin to roll in the direction shown in the Figure.
- In order to generate a defined shear force, place the outwardly projecting part of the loop material 1 in a clamp 8 and the outwardly projecting part of the hook material in a clamp 9, with a weight of 1 kg.
- 30 ▪ Allow the weight to hang freely for 10 seconds; see Fig. 6.

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- Place the sample in the tensile testing device 4 with the hook component 2 in the upper clamp 5 and the loop component in the lower clamp 6.
- Carry out the test on the two materials at an opening angle of 180°; see Fig. 7.
- The delaminating force can also be determined with repeated opening and closing of the two components if so desired. This can only be done if no deformation occurs in the material during the test.

Calculation and results

The method measures the highest peaks (max. 20) during the test.

10

F_{\max} N/25 mm

=

The highest peak during the test

F_{med} N/25 mm

=

The mean value of all peaks during the test

15

In the described tests, the shear force with respect to the loop material will preferably lie between 40 and 100 N/7.5 cm² and the delaminating force between 2 and 5 N/25 mm (mean load) and between 3 and 8 N/25 mm (peak load) respectively. Excessively high values mean that it is difficult to loosen the hook and loop components from one another without tearing said components or without removing a component from the underlying backing sheet, whilst excessively low values indicate insufficient fastening ability or holding strength. It will be seen from the following that the inventive

20

material has the properties desired and surpasses the reference material EKL in several respects.

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The results are shown in Table 2 below.

Table 2

| Fastener Device | Weight per unit area g/m ² | Shear force, N/7.5 cm ² Peak load, C:3 | | | Delaminating force, N/25 mm Mean load, C:3 | | | Delaminating force, N/25 mm Peak load, C:3 | | |
|-----------------|---|--|-----|-----|---|-----|-----|---|-----|-----|
| | | Mean | Max | Min | Mean | Max | Min | Mean | Max | Min |
| EKL | 90 | 70 | | | 3.5 | | | 5.5 | | |
| 08-370K | 60 | 82 | 89 | 75 | 3 | 4 | 3 | 5 | 6 | 4 |
| | 80 | 92 | 101 | 80 | 3.5 | 4 | 3 | 5.5 | 6.5 | 4.5 |
| | 100 | 47 | 57 | 21 | 2.5 | 3 | 2 | 4 | 6.5 | 3 |
| 08-378 | 80 | 73 | 77 | 68 | 4 | 5 | 3 | 6 | 7 | 5 |
| 08-379 | 80 | 43 | 48 | 40 | 2 | 2 | 1.2 | 3 | 4 | 2 |

The best shear force result was obtained with sample 08-370K, followed by 08-378, although this latter gave a somewhat higher delaminating force.

All tests were carried out with standard hook C200 from 3M.

Fig. 8 is a schematic illustration of a diaper with which the inventive fastener material can be used. The diaper includes an absorbent sheet which is disposed between a liquid-permeable inner sheet that lies proximal to a wearer in use and a liquid impermeable outer sheet, or backing sheet, which lies distal from the wearer in use. The diaper has a generally rectangular shape and is delimited by two short sides 10, 11 and two long sides 12, 13. Two fastener tapes that include hook material 2 are fastened to the outside of the diaper, at one short end 10, such that a free part of each fastener tape forms an extension of said short side, wherewith the hook material faces in the same direction as the inside surface of the diaper. Loop material 1 according to the invention is fastened to the outside of the diaper at the other short end 11, in each corner thereof. When placing the diaper on a wearer, the centre part of the diaper is curved around the wearer's crotch, so that the short sides 10, 11 will lie around the wearer's waist. The diaper is fastened by applying the tapes that include hook material 2 to the tapes that include loop material 1. By way of alternative, a strip of loop material can be placed along the full length of the short side, instead of using two pieces of loop material along the length of the short side 11. This is shown by a broken line in Fig. 8.

The inventive nonwoven fabric may also be used in the type of diaper or incontinence guard described in US-A-5,549,593, for instance. This type of diaper is illustrated in Figs. 9 and 10 and includes an absorbent part 14, the actual diaper, which is replaceable and secured to a belt 15 around the wearer's waist. The absorbent part 14 includes an absorbent layer disposed between a liquid-permeable inner sheet, or top sheet, which lies proximal to the wearer in use, and a liquid-impermeable outer sheet, or backing sheet, which lies distal from the wearer in use. Two strips of hook material 2 are disposed along each short side 10, 11 of the absorbent part 14, on the outer side thereof. A nonwoven fabric 1 that includes an inventive fastener surface in the form of loop material is provided on the inside of the belt 15. The short ends 10, 11 of the absorbent part 14 can be inserted in beneath the belt, wherewith the hook material 2 extending along the outer edges of the absorbent part coacts with the loop material 1

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- on the inside of the belt 15 to secure the diaper to the wearer. Alternatively, the loop material 1 may be provided on the absorbent part 14 and the hook material 2 on the belt 15. Another variant is to provide a fastener surface (either the male or female component) on the outside of the belt 15, and to provide the strip that carries either
- 5 hook material or loop material on the inside of the absorbent body 14, i.e. on that side of said body that shall face towards the wearer in use. That part of the hook and loop fastener system provided on the belt 15 may either be a continuous strip, as shown in Fig. 10, or comprise several smaller pieces.
- 10 It will be understood that the uses described above have been given only by way of example and in no way limit the scope of the invention. The inventive fastener device can be used in all cases where a hook and loop fastener system that includes a male and female component is used.

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CLAIMS

1. Nonwoven fabric that includes a surface for fastening the male component of a hook and loop fastener system which comprises a carded and needled fabric of functional fibres and binding fibres, where the functional fibres are comprised of thermoplastic polymer fibres, and where the nonwoven fabric is bonded by partially melting the binding fibres.

2. A nonwoven fabric according to Claim 1, **characterised** in that the functional fibres are comprised of one or more types of polyester fibres and/or polypropylene fibres.

3. A nonwoven fabric according to Claim 2, **characterised** in that the fabric includes two types of functional polyester fibres of mutually different thickness.

4. A nonwoven fabric according to any one of Claims 1-3, **characterised** in that the functional fibres include spiralled bi-component fibres or multi-component fibres of the side-by-side type.

5. A nonwoven fabric according to Claim 4, **characterised** in that the functional fibres include both crimped polyester fibres and spiralled fibres.

6. A nonwoven fabric according to any one of Claims 1-5, **characterised** in that the fabric contains 10-25% by weight binding fibres and 75-90% by weight functional fibres.

7. A nonwoven fabric according to any one of Claims 1-6, **characterised** in that 40-60% by weight of the functional fibres are spiralled fibres.

8. A nonwoven fabric according to any one of Claims 1-7, **characterised** in that the binding fibres comprise bi-component fibres that include a core and an outer

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casing, where the outer casing component has a lower melting point than the inner core component.

9. A method of producing a nonwoven fabric that has a fastener surface according to Claim 1, **characterised** by carding a mixture of binding fibres and functional fibres to form a fibrous web; needling the fibrous web to obtain a dense material that has a structure suitable for the male component of a hook and loop fastener to fasten thereto; and heating the needled fibrous web so as to partially melt the binding fibres.

10. A method according to Claim 9, **characterised** by smooth calendering the needled and heated fibrous web so that one surface thereof will be smooth.

11. A method according to Claim 9 or 10, **characterised** in that the binding fibres are comprised of bi-component fibres that include a core and a casing, where said casing has a lower melting point than the core; and heating the needled fibrous web so that the casings of respective binding fibres will melt while the core remains solid.

12. An absorbent article (14), such as a diaper or incontinence guard, which includes a substantially liquid-impermeable backing sheet and a hook and loop fastener system that includes a female component and a male component attached to said backing sheet for mutual coaction such as to secure the article in position on a wearer, **characterised** in that the female component (1) of the system is comprised of nonwoven fabric according to any one of Claims 1-8.

13. An article according to Claim 12, **characterised** in that the article includes an absorbent body enclosed between a liquid-permeable inner sheet that lies proximal to the wearer in use and said substantially liquid-impermeable backing sheet that lies distal from the wearer in use, said backing sheet being delimited by two short sides (10, 11) and two long sides (12, 13), wherein two male-component tabs (2)

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belonging to said fastener system are fastened to said backing sheet on each long side (12, 13) thereof close to one short side (10), so as to form an extension of the short side with the male component facing in the same direction as the inner sheet; and in that the female component (1) is provided on the backing sheet at the other short side (11).

14. An article according to Claim 13, **characterised** in that one female component piece (1) is provided in each corner of said second short side (11).

15. An article according to Claim 13, **characterised** in that the female component (1) is comprised of a strip that extends essentially along the full length of the second short side (11).

16. An article according to Claim 12, **characterised** in that said article includes two parts, a belt (15) which is intended to be fastened around the waist of a wearer, and an absorbent part (14) which, in use, is fastened to the belt by means of mutually coacting male and female components (1, 2) of the hook and loop fastener system and which includes an absorbent body enclosed between a liquid-permeable inner sheet intended to lie proximal to the wearer in use and said substantially liquid-impermeable backing sheet intended to lie distal from the wearer in use and delimited by two short sides (10, 11) and two long sides (12, 13), wherein the mutually coacting components (1, 2) are disposed along the short sides (10, 11) of said absorbent body and on said belt (15) respectively.

17. An article according to Claim 16, **characterised** in that the female component (1) is disposed on the inner surface of the belt (15) and the male component (2) is disposed on the outer surface of the absorbent body (14).

18. An article according to Claim 16, **characterised** in that the male component (2) is disposed on the inner surface of the belt (15) and the female component (1) is disposed on the outer surface of the absorbent body (14).

19. An article according to Claim 16, **characterised** in that the male component (2) is disposed on the outer surface of the belt (15) and the female component (1) is disposed on the inner surface of the absorbent body (14).

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20. An article according to Claim 16, **characterised** in that the female component (1) is disposed on the outer surface of the belt (15) and the male component (2) is disposed on the inner surface of the absorbent body (14).

10 21. The use of a nonwoven fabric that includes a fastener surface according to any of claims 1-8, which comprises a carded and needled fibrous web of functional fibres and binding fibres, where the functional fibres are comprised of thermoplastic polymer fibres, and where the nonwoven fabric is bonded by partially melting the binding fibres, as the female component in a hook and loop fastener system in an
15 absorbent article (14), such as a diaper or incontinence guard, which includes a substantially liquid-impermeable backing sheet and a hook and loop fastener system that includes a female component and a male component attached to said backing sheet for mutual coaction such as to secure the article in position on a wearer.

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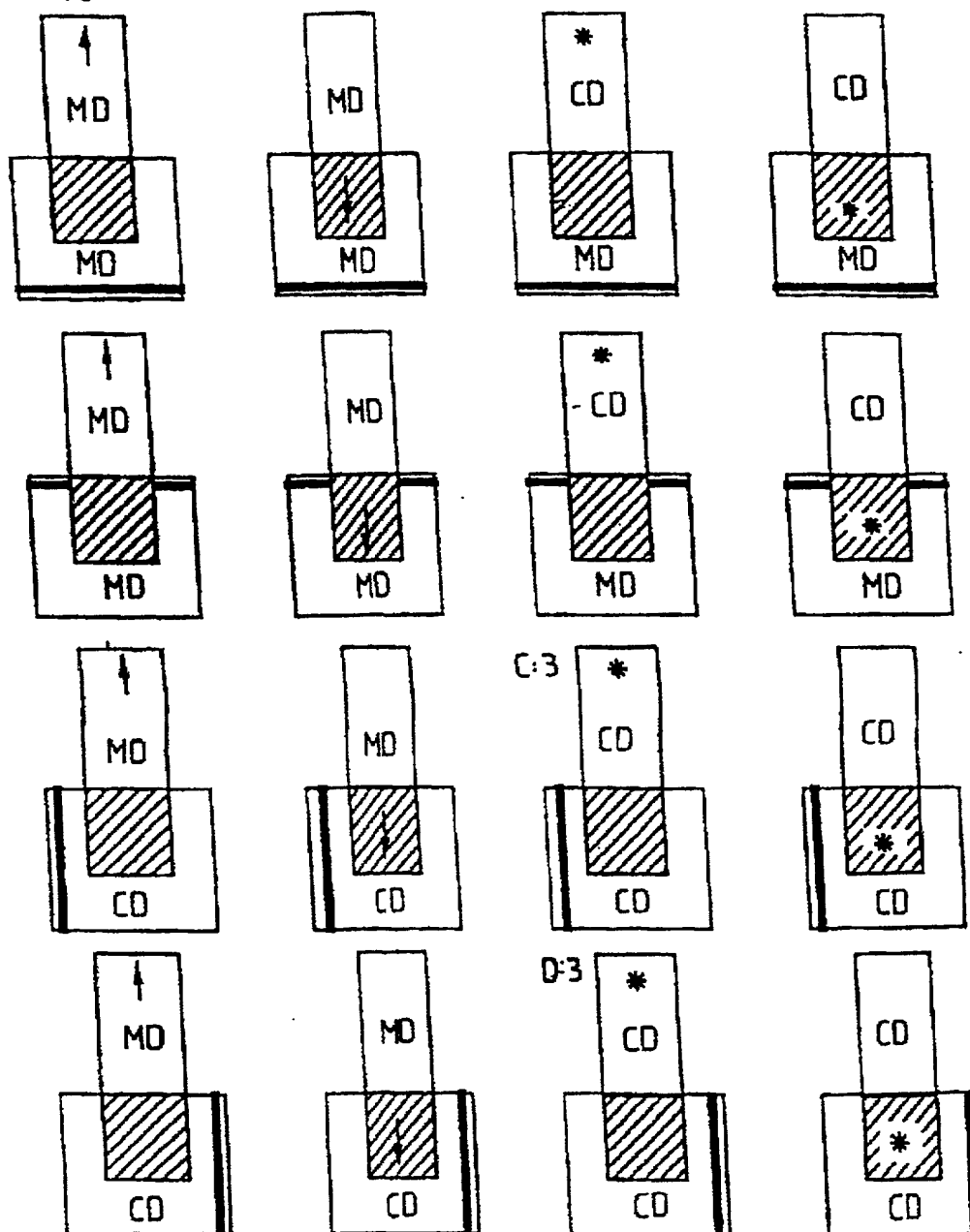


FIG.1

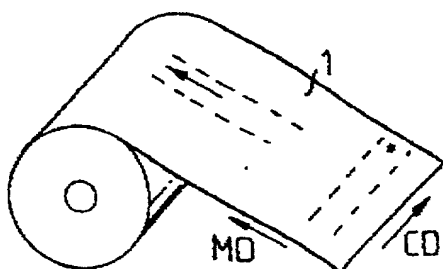


FIG. 2A

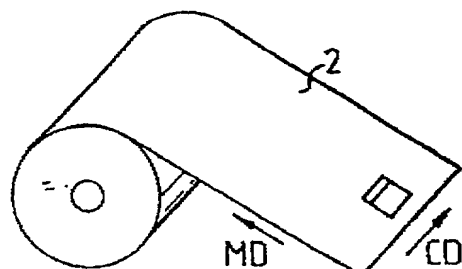


FIG. 2B

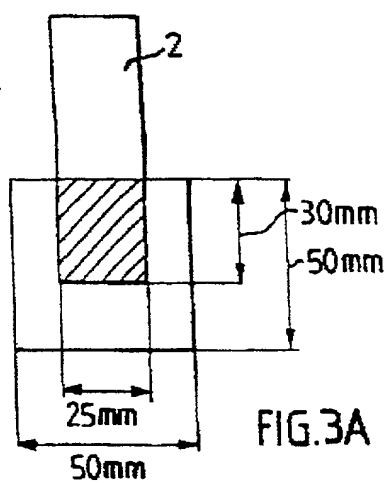


FIG. 3A

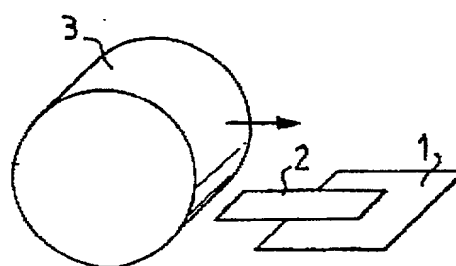


FIG. 4

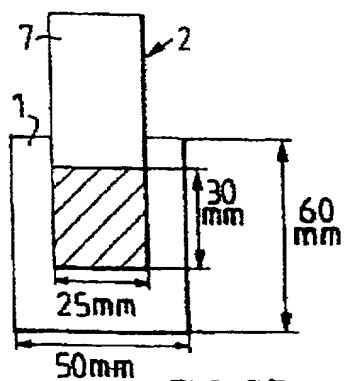


FIG. 3B

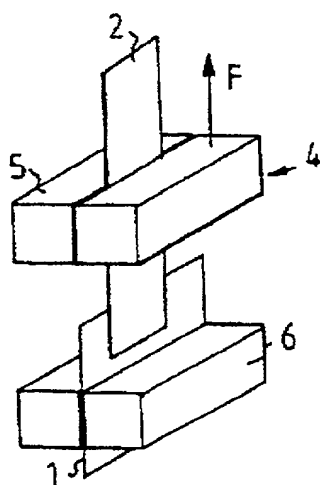


FIG. 5

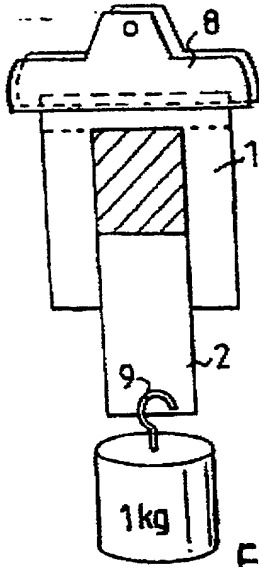


FIG. 6

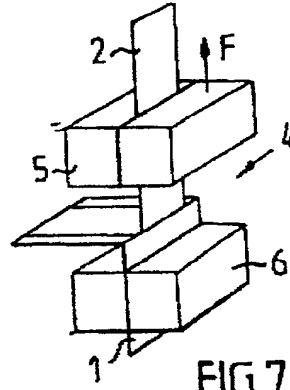


FIG. 7

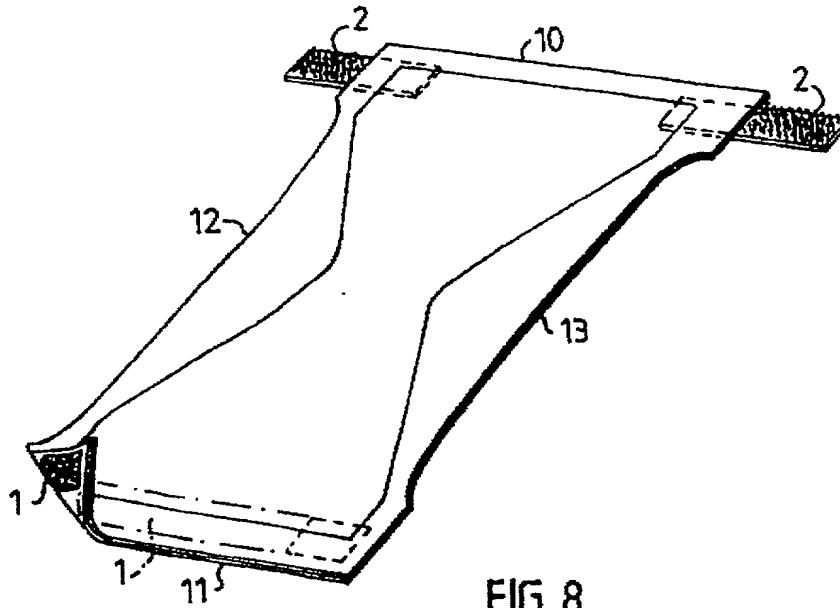


FIG. 8

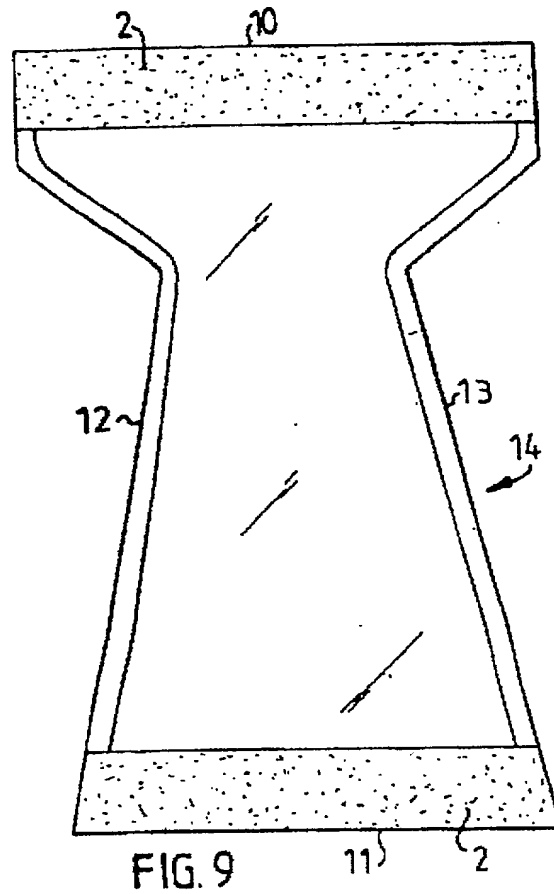


FIG. 9

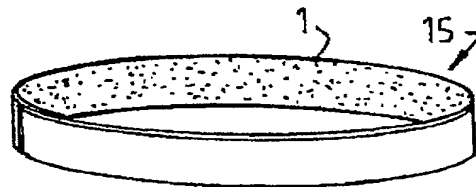


FIG. 10

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

FASTENER MEANS

the specification of which: *(check one)*

REGULAR OR DESIGN APPLICATION

☐ is attached hereto.

☐ was filed on _____ as application Serial No. _____ and was amended on _____ (if applicable).

PCT FILED APPLICATION ENTERING NATIONAL STAGE

☒ was described and claimed in International application No. PCT/SE99/02130 filed on 19 November 1999 and as amended on _____ (if any).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

PRIORITY CLAIM

I hereby claim foreign priority benefits under 35 USC 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION(S)

| Country | Application Number | Date of Filing (day, month, year) | Priority Claimed |
|---------|--------------------|-----------------------------------|------------------|
| Sweden | 9803970.4 | 19.11.98 | YES |
| | | | |

(Complete this part only if this is a continuing application.)

I hereby claim the benefit under 35 USC 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 USC 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)

(Filing Date)

(Status--patented, pending, abandoned)

POWER OF ATTORNEY

The undersigned hereby authorizes the U.S. attorney or agent named herein to accept and follow instructions from ALBIHNS STOCKHOLM AB as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

As a named inventor, I hereby appoint the following attorney(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Robert J. PATCH, Reg. No. 17,355, Andrew J. PATCH, Reg. No. 32,925, Robert F. HARGEST, Reg. No. 25,590, Benoit CASTEL, Reg. No. 35,401, Alan W. YOUNG, Reg. No. 37,970, c/o YOUNG & THOMPSON, Second Floor, 745 South 23rd Street, Arlington, Virginia 22202.

Address all telephone calls to Young & Thompson at 703/521-2297.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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(given name, family name)

Inventor's signature Ingbritt Magnusson

Date 2001-05-03

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Full name of second joint inventor, if any: _____
(given name, family name)

Inventor's signature _____

Date _____

Residence: _____

Citizenship: _____

Post Office Address: _____

Full name of third joint inventor, if any: _____
(given name, family name)

Inventor's signature _____

Date _____

Residence: _____

Citizenship: _____

Post Office Address: _____